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EXAMINER	
TIMORY, KABIR A	

ART UNIT	PAPER NUMBER
2611	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/532,912	MONTALBANO, GIUSEPPE	
	Examiner	Art Unit	
	KABIR A. TIMORY	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _03 March 2010_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-17 and 19_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) _3-7 and 9-14_ is/are allowed.

6)☒ Claim(s) _1,15 and 19_ is/are rejected.

7)☒ Claim(s) _2,8,16 and 17_ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. This office action is in response to the amendment filed on 03/03/2010. Claims 1-17 and 19 are pending in this application and have been considered below. Claim 18 is cancelled by the applicant.

2. Applicant arguments regarding the rejection under 35 U.S.C. 103(a) as being unpatentable over Nilsson et al. (US 2003/0099216) in view of Huang et al. (US 6385185) and further in view of Jamal et al. (US 5533067) have been fully considered but they are <u>not persuasive</u>. The examiner thoroughly reviewed Applicant's arguments but firmly believes that the cited reference reasonably and properly meets the claimed limitation as rejected.

Applicant's argument: "Nilsson fails to teach or suggest providing channel estimation wherein channel propagation is modeled using a linear superposition of a finite number of discrete multi-path components following an uncorrelated-scattering wide-sense stationary model. To alleviate this deficiency of Nilsson, the rejection turns to Huang. However, Huang describes at column 5, line 39 through column 7, line 25, channel estimation via use of matched filters. Such a process assumes a stationary window using a weighted average. The present invention however uses and claims linear super-position of discrete multi-path components following an uncorrelated-

scattering wide-sense stationary model. As described in paragraph [0026] of the specification. The estimation process taught by Huang is a correlated conventional method using equally weighted averaging. *See* column 5, line 44 and column 5, line 64. Not only does the cited text in Huang not teach or suggest the invention, but one skilled in relevant art would not turn to Huang to resolve the inadequacy of Nilsson. While Huang teaches a means of channel estimation, the Huang methodology is dissimilar from that claimed by the Applicant.

Examiner's response: In abstract Huang et al. disclose: "The coherent channel estimates are used to implement signal detection functions such as maximal ratio combining (MRC), coherent detection and interference cancellation. In one embodiment, a matched filter bank provides a set of matched filter outputs for different combinations of data symbols, multipath components of a received signal, and base station receive antennas. The matched filter outputs are processed in a coherent channel estimator to generate a set of coherent channel estimates. The channel estimates may be generated directly from the matched filter outputs, or may be generated by processing the matched filter outputs using a decorrelating (interpreted to be uncorrelated scattering wide-sense stationary model) detector approach. The invention also provides improved interference cancellation techniques which can be implemented using any type of coherent channel estimates". In col 2, lines 27-67, Huang et al. disclose: "An exemplary coherent channel estimator in accordance with the invention receives a set of matched filter outputs. These outputs for a kth user, k=1, 2, . . . K, are represented as y(m)k, l, a, where a=1, 2, . . . A specifies one of A receive antennas, l=1, 2, . . . L specifies one of L multipath components of the kth user, and m=1, 2, . . . M specifies one of M data symbols. The coherent channel estimator for antenna a includes a symbol-driven selection device associated with the kth user that receives as its input ML matched filter outputs y(m)k, l, a

for the kth user. The selection device is operative to select, for the kth user, L of the ML matched filter outputs which correspond to an estimate of a selected symbol for that user from a previous symbol interval. The coherent channel estimator further includes L buffers for the kth user, with each of the buffers having a width W corresponding to a designated number of symbol intervals, for storing the L selected matched filter outputs as received from the selection device. The L buffers and a selection device may be provided for each of K users, in conjunction with L summing devices for each of the K users. Each of the L summing devices for a given user is operative to sum the matched filter outputs from a corresponding one of the buffers, to form a vector. The coherent channel estimator also includes a multiplier operative to multiply the vector by a designated quantity to obtain the corresponding channel estimates. This designated quantity may include, for example, a factor 1/(WEs +L), where W is the width of the buffer and Es is the symbol energy. In an embodiment which utilizes the above-noted decorrelating detector approach, the designated quantity may also include a decorrelation matrix generated for the vector. In accordance with another aspect of the invention, the above-noted interference cancellation may be implemented for a kth user as a multistage process. A first stage of the process generates preliminary symbol estimates for each of a plurality of interfering users j, j=1, 2, . . . K, j≠k, of the system. A second stage reconstructs received signals for the interfering users, utilizing (i) the preliminary symbol estimates for those users, (ii) information regarding spreading-symbol codes and delays associated with those users, and (iii) the channel estimates. In col 4, lines 1-23, Huang et al. also teaches claimed limitation “channel estimation in a multipath environment to acquire a beamforming complex factor”. For example, in col 4 Huang et al. disclose: "An illustrative embodiment of the invention processes received CDMA signals to obtain coherent channel estimates, and utilizes these estimates to perform one or more of coherent maximal ratio combining (MRC), coherent detection and interference cancellation. The coherent channel estimates are used in the

illustrative embodiment to provide MRC. The MRC in effect weights the receive antenna outputs so as to form "beams" which collect energy from each of the users' various multipath components. These "beams" are non-adaptive, i.e., deterministic, in the sense that they are a deterministic function of the coherent channel estimates. The coherent channel estimates may also be used to implement coherent detection in conjunction with MRC. Since the MRC "beamforming" for any desired user's given multipath component may be done without regard to interfering users, there may be some multiaccess interference (MAI). As will be described in detail below, this MAI may be removed by an interference canceller which makes use of the coherent channel estimates".

Nilsson et al. in the same field of endeavor also teaches complex multipath channel estimation (see abstract, par 000-0008, 0033). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use the channel estimation as taught by Huang et al. to modify the system and method of Nilsson et al. in order to improve the performance of the system.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 15, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nilsson et al. (US 2003/0099216) in view of Huang et al. (US 6385185) and further in view of Jamal et al. (US 5533067).

Regarding claims 1 and 15:

As shown in figures 1-6, Nilsson et al. disclose a method for estimating a propagation channel in a presence of transmit beamforming with a receiver, (abstract, par 0018, lines 1-6) comprising the steps of:

accounting for a structure of two logical channels (CPICH, DPCI-I) and based on a common structure of corresponding propagation channels **(abstract, par 0007, lines 1-11, par 0033, lines 1-18)**, one (DPCH) of said two logical channels comprising two sub-channels (DPDCH, DPCCH) **(302 in figure 3)**.

Nilsson et al. disclose all of the subject matter as described above except for specifically teaching providing channel estimation in a multipath environment to acquire a beamforming complex factor; wherein the providing step comprises modeling said propagation channels in the receiver as a linear superposition of a finite number of discrete multipath components (signal component samples is interpreted to receive a finite number of discrete multipath components) (p=1,..., P) following an uncorrelated-scattering wide-sense stationary model, and wherein a multipath component is characterized by a time-varying multipath complex coefficient (Cp (t) and βpCp (t)) and a delay (Tp).

However, Huang et al. in the same field of endeavor teach providing channel estimation in a multipath environment to acquire a beamforming complex factor; wherein the providing step comprises modeling said propagation channels in the receiver as a linear superposition of a finite number of discrete multipath components (signal component samples is interpreted to receive a finite number of discrete multipath components) (p=1,..., P) following an uncorrelated-scattering wide-sense stationary model **(abstract, col 2, lines 27-67, col 4, lines 1-23, col 5, lines 39-52)**. Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use the channel estimation as taught by Huang et al. to modify the system and method of Nilsson et al. in order to improve the performance of the system.

Nilsson et al. and Huang et al. disclose all of the subject matter as described above except for specifically teaching wherein a multipath component is characterized by a time-varying multipath complex coefficient (Cp (t) and βpCp (t)) and a delay (Tp).

However, Jamal et al. in the same field of endeavor teach wherein a multipath component is characterized by a time-varying multipath complex coefficient (Cp (t) and βpCp (t)) and a delay (Tp) **(col 6, lines 51-67, col 11, lines 42-63, col 17, lines 61-67, col 18, lines 1-5)**. Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use the channel estimation of time-varying channel as taught by Jamal et al. to modify the system and method of Nilsson et al. in order to solve issues such as rapidly fading radio channel of rapidly varying channel in the communication system **(col 4, lines 24-27)**.

Regarding claim 19:

Nilsson et al. disclose further disclose a communication system using the method for estimating a propagation channel in the presence of transmit beamforming as claimed in claim 1, when information data are transmitted through a beamforming system **(par 0018)**.

Allowable Subject Matter

5. Claims 3-7, and 9-14 are allowed.

6. Claims 2, 8, and16-17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record, Nilsson et al. does not teach or suggest

performing interpolation of the above obtained ML instantaneous second (DPCH) and first (CPICH) channel multipath complex coefficient estimates ($\hat{c}_{dpch}(n)$, and $\hat{c}_{pich}(n)$) to a lowest symbol rate of said second (DPCH) and first (CPICH) logical channels;

computing an optimal linear prediction filter (f) according to a joint second and first channels (DPCH-CPICH) maximum-a-posteriori (MAP) criterion;

filtering the interpolated ML instantaneous second (DPCH) and first (CPICH) channel multipath complex coefficient estimates obtained at step 2 with said optimal linear prediction filter in order to obtain a MAP first sub-channel (DPDCH) multipath coefficient estimate ($\tilde{c}_{dpch-MAP}(k)$); and

interpolating said MAP first sub-channel (DPDCH) multipath coefficient estimate ($\tilde{c}_{dpch-MAP}(k)$) to the second logical channel (DPCH) symbol rate when said symbol rate is lower than the first logical channel (CPICH) symbol rate.

The prior art of record, Nilsson et al. also does not teach or suggest

means for building an estimate ($\hat{\phi}_{dc}(l)$) of a cross-correlation ($E\{\hat{c}^{\prime}_{dpch}(n)$ and ($\hat{c}^{*}_{cpich}(n-l)\}$) between the first (CPICH) and second (DPCH) logical channel corresponding propagation channel multipath coefficient instantaneous maximum likelihood estimates ($\hat{c}_{dpch}(n)$ and ($\hat{c}_{cpich}(n)$) and an estimate ($\hat{\phi}_{cc}(l)$) of an autocorrelation ($E\{\hat{c}_{dpch}(n)$ and ($\hat{c}_{cpich}(n-l)\}$) between the first logical channel (CPICH) corresponding propagation channel multipath coefficient instantaneous maximum likelihood estimates ($\hat{c}_{cpich}(n)$) at non-zero correlation lag ($l\neq 0$) for noise suppression,

means for estimating a beamforming complex factor (δ) from said cross-correlation and the auto correlation estimates (($\hat{\phi}_{dc}(l)$) and ($\hat{\phi}_{cc}(l)$),

means for building a first sub-channel (DPDCH) multipath coefficient estimate ($\tilde{c}_{dpdch}(k)$) as a product of the optimal maximum a posterion estimate ($\tilde{c}_{cpich-MAP}(k)$) of the first channel (CPICH) multipath coefficient and the cross-correlation and the auto correlation estimates (($\hat{\phi}_{dc}(l)$) and ($\hat{\phi}_{cc}(l)$), and

means for interpolating said first sub-channel (DPDCH) multipath coefficient estimate ($\tilde{c}_{dpdch-MAP}(k)$) to the second logical channel (DPCH) symbol rate when said symbol rate is lower than the first logical channel (CPICH) symbol rate.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KABIR A. TIMORY whose telephone number is (571)270-1674. The examiner can normally be reached on 8:00 AM - 4:30 PM Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shuwang Liu can be reached on 571-272-3036. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kabir A Timory/
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